

Refine Search

Search Results -

| Term | Documents |
|---|-----------|
| ALLOCAT\$ | 0 |
| ALLOCAT | 120 |
| ALLOCABILITY | 10 |
| ALLOCATABLE | 1454 |
| ALLOCATABLEBYTES | 1 |
| ALLOCATABLEEE | 1 |
| ALLOCATABLEPERSISTENTBYTES | 1 |
| ALLOCATABLE-ADDRESSABLE | 1 |
| ALLOCATABLE-AREA | 1 |
| ALLOCATABLE-OPT | 1 |
| ALLOCATABLE/UNALLOCATABLE | 1 |
| (L5 AND ALLOCAT\$).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD. | 16 |

[There are more results than shown above. Click here to view the entire set.](#)

Database:

US Pre-Grant Publication Full-Text Database
 US Patents Full-Text Database
 US OCR Full-Text Database
 EPO Abstracts Database
 JPO Abstracts Database
 Derwent World Patents Index
 IBM Technical Disclosure Bulletins

Search:

Refine Search

Recall Text
Clear
Interrupt

Search History

DATE: Saturday, December 10, 2005 [Printable Copy](#) [Create Case](#)

Set Name **Query**

side by side

Hit Count

Set Name
result set

DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR

| | | | |
|-----------|----------------------------|-----|-----------|
| <u>L6</u> | L5 and allocat\$ | 16 | <u>L6</u> |
| <u>L5</u> | L4 and (volume near block) | 21 | <u>L5</u> |
| <u>L4</u> | L3 and (file near system) | 114 | <u>L4</u> |
| <u>L3</u> | L2 and "read-only" | 158 | <u>L3</u> |
| <u>L2</u> | snapshot near copy | 478 | <u>L2</u> |
| <u>L1</u> | snashop near copy | 0 | <u>L1</u> |

END OF SEARCH HISTORY

Hit List

| | | | | | |
|-------------------------------|-----------------------|-------------------------------------|-----------------------|--------------------------|---------------------------|
| First Hit | Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs |
| Generate OACS | | | | | |

Search Results - Record(s) 1 through 16 of 16 returned.

1. Document ID: US 20050273570 A1

Using default format because multiple data bases are involved.

L6: Entry 1 of 16

File: PGPB

Dec 8, 2005

PGPUB-DOCUMENT-NUMBER: 20050273570

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050273570 A1

TITLE: Virtual space manager for computer having a physical address extension feature

PUBLICATION-DATE: December 8, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|------------------------|-------------|-------|---------|
| DeSouter, Marc A. | Wayne | NJ | US |
| Armangau, Philippe | Acton | MA | US |
| Ahmed, Ishraq Mohammed | Cary | NC | US |
| Glidewell, Keith | Chapel Hill | NC | US |

US-CL-CURRENT: 711/203; 711/170, 711/207

| | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|-----------------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KUMC | Drawn |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|-----------------------|

2. Document ID: US 20050216788 A1

L6: Entry 2 of 16

File: PGPB

Sep 29, 2005

PGPUB-DOCUMENT-NUMBER: 20050216788

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050216788 A1

TITLE: Fast backup storage and fast recovery of data (FBSRD)

PUBLICATION-DATE: September 29, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|-------------------|--------|-------|---------|
| Mani-Meitav, Irit | Atlit | | IL |
| Sarfati, Assaf | Tiv'on | | IL |

US-CL-CURRENT: 714/6

| | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|--------------------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KUMC | Drawn Ds |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|--------------------------|

3. Document ID: US 20050216695 A1

L6: Entry 3 of 16

File: PGPB

Sep 29, 2005

PGPUB-DOCUMENT-NUMBER: 20050216695

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050216695 A1

TITLE: Memory extension for a data processor to provide both common and separate physical memory areas for virtual memory spaces

PUBLICATION-DATE: September 29, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|-------------------|----------|-------|---------|
| Bono, Jean-Pierre | Westboro | MA | US |

US-CL-CURRENT: 711/203; 711/207, 711/209

| | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|--------------------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KUMC | Drawn Ds |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|--------------------------|

4. Document ID: US 20050193245 A1

L6: Entry 4 of 16

File: PGPB

Sep 1, 2005

PGPUB-DOCUMENT-NUMBER: 20050193245

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050193245 A1

TITLE: Internet protocol based disaster recovery of a server

PUBLICATION-DATE: September 1, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|---------------------|-------------------|-------|---------|
| Hayden, John M. | Holliston | MA | US |
| Wang, Hongmei | Shrewsbury | MA | US |
| Corniquet, Frederic | Le Pecq | MA | FR |
| Armangau, Philippe | Acton | MA | US |
| Donette, Pascal | Magny les Hameaux | | FR |
| John, Aju | Northborough | | US |

US-CL-CURRENT: 714/13

| | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|--------------------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KUMC | Drawn Ds |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|--------------------------|

 5. Document ID: US 20050065985 A1

L6: Entry 5 of 16

File: PGPB

Mar 24, 2005

PGPUB-DOCUMENT-NUMBER: 20050065985

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050065985 A1

TITLE: Organization of read-write snapshot copies in a data storage system

PUBLICATION-DATE: March 24, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|--------------------|---------------|-------|---------|
| Tummala, Himabindu | South Grafton | MA | US |
| Armangau, Philippe | Acton | MA | US |

US-CL-CURRENT: 707/201

| | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|----------------------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Drawn D... |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|----------------------------|

 6. Document ID: US 20050015663 A1

L6: Entry 6 of 16

File: PGPB

Jan 20, 2005

PGPUB-DOCUMENT-NUMBER: 20050015663

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20050015663 A1

TITLE: Data recovery with internet protocol replication with or without full resync

PUBLICATION-DATE: January 20, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|-------------------------|---------------|-------|---------|
| Armangau, Philippe | Acton | MA | US |
| Bergant, Milena | North Grafton | MA | US |
| Srinivasan, Karthikeyan | Framingham | MA | US |

US-CL-CURRENT: 714/15

| | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|----------------------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Drawn D... |
|----------------------|-----------------------|--------------------------|-----------------------|------------------------|--------------------------------|----------------------|---------------------------|---------------------------|-----------------------------|------------------------|----------------------|----------------------------|

 7. Document ID: US 20040267836 A1

L6: Entry 7 of 16

File: PGPB

Dec 30, 2004

PGPUB-DOCUMENT-NUMBER: 20040267836

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040267836 A1

TITLE: Replication of snapshot using a file system copy differential

PUBLICATION-DATE: December 30, 2004

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|--------------------|---------------|-------|---------|
| Armangau, Philippe | Acton | MA | US |
| Bergant, Milena | North Grafton | MA | US |

US-CL-CURRENT: 707/203

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequences](#) | [Attachments](#) | [Claims](#) | [KIMC](#) | [Drawn Ge](#)

8. Document ID: US 20040107222 A1

L6: Entry 8 of 16

File: PGPB

Jun 3, 2004

PGPUB-DOCUMENT-NUMBER: 20040107222

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040107222 A1

TITLE: Client-server protocol for directory access of snapshot file systems in a storage system

PUBLICATION-DATE: June 3, 2004

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|-------------------|------------|-------|---------|
| Venkatesh, Dinesh | Westford | MA | US |
| Jiang, Xiaoye | Shrewsbury | MA | US |
| Zheng, Jiannan | Ashland | MA | US |
| Vahalia, Uresh | Newton | MA | US |

US-CL-CURRENT: 707/200

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequences](#) | [Attachments](#) | [Claims](#) | [KIMC](#) | [Drawn Ge](#)

9. Document ID: US 20040030951 A1

L6: Entry 9 of 16

File: PGPB

Feb 12, 2004

PGPUB-DOCUMENT-NUMBER: 20040030951

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040030951 A1

TITLE: Instantaneous restoration of a production copy from a snapshot copy in a data storage system

PUBLICATION-DATE: February 12, 2004

INVENTOR-INFORMATION:

| | | | |
|--------------------|-------|-------|---------|
| NAME | CITY | STATE | COUNTRY |
| Armangau, Philippe | Acton | MA | US |

US-CL-CURRENT: 714/6

| | | | | | | | | | | | | |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|----------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KMPC | Drawn Ds |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|----------|

 10. Document ID: US 20040030846 A1

L6: Entry 10 of 16

File: PGPB

Feb 12, 2004

PGPUB-DOCUMENT-NUMBER: 20040030846

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040030846 A1

TITLE: Data storage system having meta bit maps for indicating whether data blocks are invalid in snapshot copies

PUBLICATION-DATE: February 12, 2004

INVENTOR-INFORMATION:

| | | | |
|--------------------|---------------|-------|---------|
| NAME | CITY | STATE | COUNTRY |
| Armangau, Philippe | Acton | MA | US |
| Tummala, Himabindu | South Grafton | MA | US |

US-CL-CURRENT: 711/154; 711/159

| | | | | | | | | | | | | |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|----------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KMPC | Drawn Ds |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|----------|

 11. Document ID: US 20040030727 A1

L6: Entry 11 of 16

File: PGPB

Feb 12, 2004

PGPUB-DOCUMENT-NUMBER: 20040030727

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040030727 A1

TITLE: Organization of multiple snapshot copies in a data storage system

PUBLICATION-DATE: February 12, 2004

INVENTOR-INFORMATION:

| | | | |
|----------------------|---------------|-------|---------|
| NAME | CITY | STATE | COUNTRY |
| Armangau, Philippe | Acton | MA | US |
| Bergant, Milena | North Grafton | MA | US |
| Wang, Hongmei | Shrewsbury | MA | US |
| Potnis, Ajay | Sauth Grafton | MA | US |
| Angelone, Raymond A. | Norfoík | MA | US |

US-CL-CURRENT: 707/200

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequences](#) | [Attachments](#) | [Claims](#) | [KINIC](#) | [Drawn Obj](#)

12. Document ID: US 20030182253 A1

L6: Entry 12 of 16

File: PGPB

Sep 25, 2003

PGPUB-DOCUMENT-NUMBER: 20030182253

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030182253 A1

TITLE: System and method for restoring a single file from a snapshot

PUBLICATION-DATE: September 25, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY |
|------------------|---------------|-------|---------|
| Chen, Raymond C. | Campbell | CA | US |
| Patel, Kayuri | Cupertino | CA | US |
| Kahn, Andy C. | San Francisco | CA | US |
| Edwards, John K. | Sunnyvale | CA | US |

US-CL-CURRENT: 707/1

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequences](#) | [Attachments](#) | [Claims](#) | [KINIC](#) | [Drawn Obj](#)

13. Document ID: US 6957362 B2

L6: Entry 13 of 16

File: USPT

Oct 18, 2005

US-PAT-NO: 6957362

DOCUMENT-IDENTIFIER: US 6957362 B2

TITLE: Instantaneous restoration of a production copy from a snapshot copy in a data storage system

DATE-ISSUED: October 18, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|--------------------|-------|-------|----------|---------|
| Armangau; Philippe | Acton | MA | | |

ASSIGNEE-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY | TYPE CODE |
|-----------------|-----------|-------|----------|---------|-----------|
| EMC Corporation | Hopkinton | MA | | | 02 |

APPL-NO: 10/213335 [PALM]

DATE FILED: August 6, 2002

INT-CL: [07] G06 F 11/00

US-CL-ISSUED: 714/20; 714/15

US-CL-CURRENT: 714/20; 714/15

FIELD-OF-SEARCH: 714/15, 714/16, 714/19, 714/20

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

| PAT-NO | ISSUE-DATE | PATENTEE-NAME | US-CL |
|---------------------|----------------|-------------------|------------|
| <u>4608688</u> | August 1986 | Hansen et al. | 371/11 |
| <u>4686620</u> | August 1987 | Ng | 364/200 |
| <u>4755928</u> | July 1988 | Johnson et al. | 364/200 |
| <u>4815028</u> | March 1989 | Saitoh | 714/20 |
| <u>5060185</u> | October 1991 | Naito et al. | 364/900 |
| <u>5089958</u> | February 1992 | Horton et al. | 714/5 |
| <u>5206939</u> | April 1993 | Yanai et al. | 395/400 |
| <u>5357509</u> | October 1994 | Ohizumi | 714/7 |
| <u>5381539</u> | January 1995 | Yanai et al. | 395/425 |
| <u>5535381</u> | July 1996 | Kopper | 395/600 |
| <u>5596706</u> | January 1997 | Shimazaki et al. | 395/182.04 |
| <u>5673382</u> | September 1997 | Cannon et al. | 395/182.04 |
| <u>5737747</u> | April 1998 | Vishlitzky et al. | 711/118 |
| <u>5742792</u> | April 1998 | Yanai et al. | 395/489 |
| <u>5819292</u> | October 1998 | Hitz et al. | 707/203 |
| <u>5829046</u> | October 1998 | Tzelnic et al. | 711/162 |
| <u>5829047</u> | October 1998 | Jacks et al. | 711/162 |
| <u>5835953</u> | November 1998 | Ohran | 711/162 |
| <u>5835954</u> | November 1998 | Duyanovich et al. | 711/162 |
| <u>5915264</u> | June 1999 | White et al. | 711/168 |
| <u>5923878</u> | July 1999 | Marsland | 395/704 |
| <u>5974563</u> | October 1999 | Beeler, Jr. | 714/5 |
| <u>6016553</u> | January 2000 | Schneider et al. | 714/21 |
| <u>6061770</u> | May 2000 | Franklin | 711/162 |
| <u>6076148</u> | June 2000 | Kedem | 711/162 |
| <u>6078929</u> | June 2000 | Rao | 707/200 |
| <u>6269431</u> | July 2001 | Dunham | 711/162 |
| <u>6279011</u> | August 2001 | Muhlestein | 707/204 |
| <u>6434681</u> | August 2002 | Armangau | 711/162 |
| <u>6549992</u> | April 2003 | Armangau et al. | 711/162 |
| <u>6594781</u> | July 2003 | Komasaka et al. | 714/19 |
| <u>6618794</u> | September 2003 | Sicola et al. | 711/154 |
| <u>2003/0079102</u> | April 2003 | Lubbers et al. | 711/202 |
| <u>2003/0158873</u> | August 2003 | Sawdon et al. | 707/204 |
| <u>2003/0188101</u> | October 2003 | Fore et al. | 711/114 |
| <u>2004/0030727</u> | February 2004 | Armangau et al. | 714/6 |

2004/0030846

February 2004

Armangau et al.

711/154

OTHER PUBLICATIONS

Mendel Rosenblum and John K. Ousterhout, "The Design and Implementation of a Log-Structured File System," ACM Transactions on Computer Systems, vol. 10, No. 1, Feb. 1992, pp. 26-52.

Fred Douglis and John Ousterhout, "Log-Structured File Systems," in Spring COMPCON89, Feb. 27-Mar. 31, 1989, Thirty-Fourth IEEE Computer Society International Conference, San Francisco, CA, pp. 124-129.

David A. Patterson, Peter Chen, Garth Gibson, and Randy H. Katz, "Introduction to Redundant Arrays of Inexpensive Disks (RAID)," in Spring COMPCON89, Feb. 27-Mar. 31, 1989, Thirty-Fourth IEEE Computer Society International Conference, San Francisco, CA, pp. 112-117.

D.L. Burkes and R.K. Treiber, "Design Approaches for Real-Time Transaction Processing Remote Site Recovery," in Spring COMPCON90, Feb. 26-Mar. 2, 1990, Thirty-Fifth IEEE Computer Society International Conference, San Francisco, CA, pp. 568-572.

"VERITAS NetBackup and Storage Migrator"

[http://www.sun.com/stora.../netbackup.html; \\$sessionid\\$QEOQTDQAAAC2QHAMTA1FU5Y](http://www.sun.com/stora.../netbackup.html; $sessionid$QEOQTDQAAAC2QHAMTA1FU5Y), published at least as early as Oct. 28, 2000, 5 pages.

R. Stager and D. Hitz, Internet Draft, filename "draft-stager-iguard-netapp-backup-0.5.txt" Network Data Management Protocol (NDMP), last update Oct. 12, 1999, pp. 1-73.

"Network Data Management Protocol (NDMP)," <http://www.ndmp.org/info/>; NDMP White Paper, <http://www.ndmp.org/info/technology/wp.html>; "Protocol Specification Summary, Document Version: 1.7.2S," http://www.ndmp.org/info/spec_summary.html; "Legato Systems Embraces the NDMP Compliant in Q3," <http://www-ftp.legata.com/News/Press/PR209.html>; published at least as early as Oct. 11, 1999, 17 pages.

"RFC 1094--NFS: Network File System Protocol Specification," Network Working Group, Request for Comments: 1094, Sun Microsystems, Inc., Mar. 1989, pp. 1-27, <http://rfc.sunsite.dk/rfc/rfc1094.html>.

Uresh Vahalia, Unix Internals--The New Frontiers, Prentice-Hall Inc., New Jersey, 1996, Chapter 9, File System Implementations, pp. 261-289.

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Koop, P., "Replication at Work. (four companies use Oracle and Sybase replication servers to solve business problems)," DBMS, vol. 8, No. 3, p. 54(4), Mar. 1995.

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VERITAS Volume Replication and Oracle Databases, A Solutions White Paper, Veritas Software Corporation, Mountain View, CA, May 29, 2000, pp. 1-31.

Nabil Osorio and Bill Lee, Guidelines for Using Snapshot Storage Systems for Oracle

Databases, Oracle Corporation, Oct. 2001, pp. 12.

ART-UNIT: 2114

PRIMARY-EXAMINER: Beausoleil; Robert

ASSISTANT-EXAMINER: Chu; Gabriel L.

ATTY-AGENT-FIRM: Auchterlonie; Richard C. Novak Druce & Quigg, LLP

ABSTRACT:

A data storage system maintains a production dataset supported by a clone volume, and multiple snapshot datasets supported by respective save volumes in a snapshot queue. In order to instantaneously restore the production dataset with the state of any specified snapshot, the data storage system responds to requests for read/write access to the production dataset by reading from the specified snapshot dataset and writing to the production dataset. The data storage system keeps a record of data blocks that have been modified by writing to the production dataset. The data storage system initiates a process of copying data blocks from the specified snapshot dataset to the production dataset if the record of the data blocks indicates that the data blocks have not yet been modified by writing to the production dataset.

31 Claims, 40 Drawing figures

Full Title Citation Patent Review Classification Date Reference Claims KIPOC Drawn By

14. Document ID: US 6934822 B2

L6: Entry 14 of 16

File: USPT

Aug 23, 2005

US-PAT-NO: 6934822

DOCUMENT-IDENTIFIER: US 6934822 B2

TITLE: Organization of multiple snapshot copies in a data storage system

DATE-ISSUED: August 23, 2005

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|----------------------|---------------|-------|----------|---------|
| Armangau; Philippe | Acton | MA | | |
| Bergant; Milena | North Grafton | MA | | |
| Wang; Hongmei | Shrewsbury | MA | | |
| Potnis; Ajay S. | South Grafton | MA | | |
| Angelone; Raymond A. | Norfolk | MA | | |

ASSIGNEE-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY | TYPE CODE |
|-----------------|------|-------|----------|---------|-----------|
| EMC Corporation | | | | | 02 |

APPL-NO: 10/213242 [PALM]
DATE FILED: August 6, 2002

INT-CL: [07] G08 F 12/00

US-CL-ISSUED: 711/162; 707/10, 707/201, 714/6, 714/15, 714/20
US-CL-CURRENT: 711/162; 707/10, 707/201, 714/15, 714/20, 714/6

FIELD-OF-SEARCH: 707/10, 707/201-205, 709/104, 711/161, 711/162, 711/156, 711/165, 714/6, 714/15, 714/20

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

| PAT-NO | ISSUE-DATE | PATENTEE-NAME | US-CL |
|---------------------|----------------|-------------------|------------|
| <u>4608688</u> | August 1986 | Hansen et al. | 371/11 |
| <u>4686620</u> | August 1987 | Ng | 364/200 |
| <u>4755928</u> | July 1988 | Johnson et al. | 364/200 |
| <u>5060185</u> | October 1991 | Naito et al. | 364/900 |
| <u>5206939</u> | April 1993 | Yanai et al. | |
| <u>5381539</u> | January 1995 | Yanai et al. | |
| <u>5535381</u> | July 1996 | Kopper | |
| <u>5596706</u> | January 1997 | Shimazaki et al. | 395/182.04 |
| <u>5673382</u> | September 1997 | Cannon et al. | |
| <u>5737747</u> | April 1998 | Vishlitzky et al. | 711/118 |
| <u>5742792</u> | April 1998 | Yanai et al. | |
| <u>5819292</u> | October 1998 | Hitz et al. | 707/203 |
| <u>5829046</u> | October 1998 | Tzelnic et al. | 711/162 |
| <u>5829047</u> | October 1998 | Jacks et al. | 711/162 |
| <u>5835954</u> | November 1998 | Duyanovich et al. | 711/162 |
| <u>5915264</u> | June 1999 | White et al. | 711/168 |
| <u>5923878</u> | July 1999 | Marsland | 395/704 |
| <u>5974563</u> | October 1999 | Beeler, Jr. | 714/5 |
| <u>6061770</u> | May 2000 | Franklin | 711/162 |
| <u>6076148</u> | June 2000 | Kedem | 711/162 |
| <u>6078929</u> | June 2000 | Rao | 707/200 |
| <u>6269431</u> | July 2001 | Dunham | 711/162 |
| <u>6279011</u> | August 2001 | Muhlestein | 707/204 |
| <u>6434681</u> | August 2002 | Armangau | 711/162 |
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ART-UNIT: 2187

PRIMARY-EXAMINER: Chace; Christian P.

ATTY-AGENT-FIRM: Auchterlonie; Richard C. Novak Druce & Quigg, LLP.

ABSTRACT:

A file server maintains a production file system supported by a clone volume, and multiple snapshot file systems supported by respective save volumes in a snapshot queue. Before a data block is modified for the first time after creation of the youngest snapshot, the data block is copied from the clone volume to the save volume of the youngest snapshot. A bit map indicates the blocks that have already been copied, and a block map shows the save block address for each corresponding clone block address. When a new snapshot is created, the bit and block maps are converted to a hash index that is kept linked to the save volume of what had been the youngest snapshot. When other than the oldest snapshot file system is deleted, the respective save volume is retained as a hidden object until it becomes the oldest save volume.

54 Claims, 40 Drawing figures

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Search](#) | [Print](#) | [Claims](#) | [KWMC](#) | [Drawn Da](#)

15. Document ID: US 6792518 B2

L6: Entry 15 of 16

File: USPT

Sep 14, 2004

US-PAT-NO: 6792518

DOCUMENT-IDENTIFIER: US 6792518 B2

TITLE: Data storage system having mata bit maps for indicating whether data blocks are invalid in snapshot copies

DATE-ISSUED: September 14, 2004

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|--------------------|---------------|-------|----------|---------|
| Armangau; Philippe | Acton | MA | | |
| Tummala; Himabindu | South Grafton | MA | | |

ASSIGNEE-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY | TYPE CODE |
|-----------------|-----------|-------|----------|---------|-----------|
| EMC Corporation | Hopkinton | MA | | | 02 |

APPL-NO: 10/213241 [PALM]

DATE FILED: August 6, 2002

INT-CL: [07] G06 F 12/00

US-CL-ISSUED: 711/162; 711/112, 711/156, 707/203, 707/204, 714/5
 US-CL-CURRENT: 711/162; 707/203, 707/204, 711/112, 711/156, 714/5

FIELD-OF-SEARCH: 707/203, 707/204, 711/112, 711/156, 711/161, 711/162, 714/5

PRIOR-ART-DISCLOSED:

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| <u>6434681</u> | August 2002 | Armangau | 711/162 |
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Nabil Osorio and Bill Lee, Guidelines for Using Snapshot Storage Systems for Oracle Databases, Oracle Corporation, Oct. 2001, pp. 12.

ART-UNIT: 2187

PRIMARY-EXAMINER: Moazzami; Nasser

ASSISTANT-EXAMINER: Chace; Christian P.

ATTY-AGENT-FIRM: Novak Druce LLP Auchterlonie; Richard C.

ABSTRACT:

In a data storage system providing access to a production dataset and snapshot

copies of the production dataset, a production meta bit map identifies blocks of storage that are invalid in the production dataset. If a block in the production dataset is invalid when a snapshot copy is being made, then there is no need to copy the block to storage for the snapshot before writing to the block. Moreover, if a block in the production dataset supporting a snapshot copy is dynamically invalidated, it may be kept in the production dataset until it is written to. For this purpose, a respective snapshot copy of the meta bit map is made and kept with each of the snapshot datasets, and the snapshot copies of the meta bit map are merged in order to indicate the blocks that are invalid for all of the snapshots.

46 Claims, 40 Drawing figures

[Full | Title | Citation | Front | Review | Classification | Date | Reference | ] [ Claims] [ RKC] [ Drawings]

16. Document ID: US 20050065985 A1

L6: Entry 16 of 16

File: DWPI

Mar 24, 2005

DERWENT-ACC-NO: 2005-252887

DERWENT-WEEK: 200526

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TITLE: File server operation method in data network, involves checking whether save volume block is allocated to specified block of read-write snapshot copy of production file system, and reading data from allocated save block

INVENTOR: ARMANGAU, P; TUMMALA, H

PRIORITY-DATA: 2003US-0668783 (September 23, 2003)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|--------------------------|----------------|----------|-------|------------|
| <u>US 20050065985 A1</u> | March 24, 2005 | | 024 | G06F012/00 |

INT-CL (IPC): G06 F 12/00

ABSTRACTED-PUB-NO: US20050065985A

BASIC-ABSTRACT:

NOVELTY - The save volume blocks are allocated to a specified block of a read-write snapshot copy of a production file system, while writing new data to read-write snapshot copy. The allocation of save volume block to specified block of read-write snapshot copy, is checked while reading read-write snapshot copy. When save block is allocated, data from allocated block is read, else related read-only snapshot copy of file system is read.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for file server.

USE - For operating file server (claimed) used for creating and maintaining rear-write snapshot copy of production file system in data network.

ADVANTAGE - The series of read-only snapshots of the production file system are maintained in the file server efficiently. The backup processing time and the backup storage capacity of the file server are reduced reliably. The production

file can be restored with specified read-write snapshot copy easily.

DESCRIPTION OF DRAWING(S) - The figure shows a block diagram of the data network.

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Search](#) | [Help](#) | [Claims](#) | [KJCNC](#) | [Drawn P](#)

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| Term | Documents |
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| ALLOCABILITY | 10 |
| ALLOCATABLE | 1454 |
| ALLOCATABLEBYTES | 1 |
| ALLOCATABLEEE | 1 |
| ALLOCATABLEPERSISTENTBYTES | 1 |
| ALLOCATABLE-ADDRESSABLE | 1 |
| ALLOCATABLE-AREA | 1 |
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